1. A magnetic tunneling junction (MTJ) device in an MRAM configuration comprising:

a substrate having a substantially planar upper surface;

a bottom conductor lead layer formed on said substrate, said bottom conductor layer formed of substantially planar layers and further comprising:

a crystalline growth enhancing seed layer formed on said substrate;

a non-magnetic metal layer formed on said seed layer, said metal having its crystal plane aligned by said seed layer parallel to the plane of said metal layer;

a Ta overlayer formed on said metal layer, an upper surface said Ta layer being sputter-etched and rendered amorphous;

a NiCr seed layer formed on said sputter-etched Ta layer;

a pinning layer of antiferromagnetic material formed on said seed layer;

a synthetic pinned layer formed on said pinning layer;

a smooth, uniform, ultra-thin layer of in-situ radical oxidized (ROX) Al formed as a barrier layer on said pinned layer;

a ferromagnetic free layer formed on said barrier layer;

a capping layer and upper conducting lead layer formed on said MTJ layer.

2. The device of claim 1 wherein each of said first and second seed layers is a layer of NiCr with 35-45 atom % Cr formed to a thickness between approximately 40 and 60 angstroms.

3. The device of claim 1 wherein the metal layer is a layer of Ru formed to a thickness between approximately 250 and 1000 angstroms.

4. The device of claim 1 wherein the Ta overlayer is formed to an initial thickness between approximately 60 and 80 angstroms and is then reduced in thickness by between approximately 20 and 30 angstroms by a process of sputter-etching which also produces a smooth and amorphous surface.

5. The device of claim 1 wherein the NiCr seed layer is formed of NiCr having between approximately 35%-45% Cr by number of atoms.

6. The device of claim 1 wherein the antiferromagnetic pinning layer is a layer of MnPt formed to a thickness of between approximately 100 and 200 angstroms.

7. The device of claim 1 wherein the pinned layer is synthetic antiferromagnetically pinned layer comprising a first layer of CoFe(10%) formed to a thickness between approximately 15 and 25 angstroms, on which is formed a coupling layer of Ru, formed to a thickness between approximately 7 and 8 angstroms, on which is formed a second

layer of CoFe(25%) or CoFe(50%), formed to a thickness between approximately 10 and 20 angstroms, wherein the two CoFe layers are coupled with antiparallel magnetizations.

8. The device of claim 1 wherein the tunneling barrier layer is a layer of Al, formed to a thickness between approximately 7 and 12 angstroms and oxidized in-situ by a process of radical oxidation.

9. The device of claim 1 wherein the ferromagnetic free layer is a double layer comprising a layer of CoFe formed to a thickness between approximately 5 and 15 angstroms on which is formed a layer of NiFe of a thickness between approximately 20 and 50 angstroms.

10. The device of claim 1 wherein the upper capping layer is a layer of Ru formed to a thickness of between approximately 200 and 300 angstroms.

11. A method of forming a magnetic tunneling junction (MTJ) MRAM device with an ultra-thin tunneling barrier layer of high smoothness and breakdown voltage comprising:

providing a substrate having a substantially planar upper surface;

forming a first NiCr seed layer on said substrate;

forming a non-magnetic metal layer on said seed layer;

forming a Ta overlayer on said metal layer and sputter-etching said overlayer;

forming a second NiCr seed layer on said sputter-etched Ta overlayer;

forming an AFM pinning layer on said seed layer;

forming a pinned layer on said pinning layer;

forming a layer of Al on said pinned layer; and

oxidizing said Al layer in a plasma oxidation chamber, by a process of radical oxidation, to form a tunneling barrier layer on said pinned layer, said tunneling barrier layer being ultra-thin, smooth and having a high breakdown voltage as a result of the NiCr seed layer formed on the sputter-etched Ta overlayer; and

forming a free layer on said tunneling barrier layer;

forming an upper capping layer on said free layer.

12. The method of claim 11 wherein all layer formations are by sputtering in an ultra-high vacuum sputtering chamber.

13. The method of claim 11 wherein said first and second NiCr seed layers are formed of NiCr having 35%-45% Cr by number of atoms.

14. The method of claim 11 wherein the metal layer is a layer of Ru formed to a thickness between approximately 250 and 1000 angstroms.

15. The method of claim 11 wherein the overlayer of Ta is formed to a thickness between approximately 60 and 80 angstroms and is then sputter-etched to remove

between approximately20 and 30 angstroms of said Ta and to render the sputter-etched surface smooth and amorphous.

16. The method of claim 11 wherein the formation of the synthetic pinned layer comprises:

forming a first ferromagnetic layer, which is a layer of CoFe(10%), to a thickness between approximately 15 and 25 angstroms;

forming a coupling layer of Ru, to a thickness between approximately 7 and 8 angstroms on said first layer;

forming a second ferromagnetic layer, which is a layer of CoFe(25%) or CoFe(50%), to a thickness between approximately 10 and 20 angstroms;

magnetically coupling the two CoFe layers with antiparallel magnetizations.

17. The method of claim 11 wherein the Al layer is formed to a thickness between approximately 7 and 12 angstroms.

18. The method of claim 11 wherein the process of radical oxidation of said Al layer further comprises:

placing the Al layer into a plasma oxidation chamber that includes an upper electrode, a lower electrode and a grid positioned between said electrodes;

placing said Al layer in contact with the lower electrode;

feeding the upper electrode within the chamber with 0.5 liters of oxygen gas while providing power to the upper electrode at a rate of between 500 and 800 watts to produce a shower of oxygen radicals through said grid which impinge on said Al layer.

19. The method of claim 11 wherein the ferromagnetic free layer is formed as a double layer comprising a layer of CoFe formed to a thickness between approximately 5 and 15 angstroms on which is formed a layer of NiFe of a thickness between approximately 20 and 50 angstroms.

20. The method of claim 11 wherein the upper capping layer is formed as a layer of Ru to a thickness of between approximately 200 and 300 angstroms.

21. A tunneling magnetoresistive (TMR) read head configuration comprising:

a substrate, which is a first NiFe shield and conducting lead layer, having a substantially planar upper surface;

a Ta overlayer formed on said substrate and sputter-etched to form an amorphous upper surface;

a NiCr seed layer formed on said sputter-etched amorphous surface of said Ta overlayer;

a pinning layer of antiferromagnetic material formed on said seed layer;

a synthetic pinned layer formed on said pinning layer;

a smooth, uniform, ultra-thin layer of in-situ naturally oxidized Al formed as a barrier layer on said pinned layer;

a ferromagnetic free layer formed on said barrier layer;

a capping layer formed on said free layer;

an upper conducting NiFe lead and shield layer formed on said MTJ layer.

22. The device of claim 21 wherein said seed layer is a layer of NiCr with 35-45 atom % Cr formed to a thickness between approximately 40 and 60 angstroms.

23. The device of claim 21 wherein the Ta overlayer is formed to a thickness between approximately 60 and 80 angstroms and is then sputter-etched to remove between approximately 20 and 30 angstroms and to render the sputter-etched surface smooth and amorphous.

24. The device of claim 21 wherein the antiferromagnetic pinning layer is a layer of MnPt formed to a thickness of between approximately 100 and 200 angstroms.

25. The device of claim 21 wherein the pinned layer is a synthetic antiferromagnetic pinned (SyAP) layer comprising first and second layers of CoFe magnetized in antiparallel directions and separated by a coupling layer of Ru, wherein a first layer of CoFe is CoFe(10%) formed to a thickness between approximately 20 and 25 angstroms, a second layer of CoFe is CoFe(50%) formed to a thickness between approximately 25 and 30 angstroms and the Ru is formed to a thickness between approximately 7 and 8 angstroms.

26. The device of claim 21 wherein the tunneling barrier layer is a layer of Al, formed to the thickness of two atomic layers and oxidized in-situ by a process of natural oxidation to produce an insulating layer of AlO_x.

27. The device of claim 21 wherein the tunneling barrier layer is bilayer of Hf and Al, the Hf being formed to a thickness between approximately 1 and 2 angstroms and the Al being formed to a thickness between approximately 4 and 5 angstroms and the bilayer being oxidized in-situ by a process of natural oxidation to produce an insulating layer of $HfAlO_x$.

28. The device of claim 21 wherein the ferromagnetic free layer is a double layer comprising a layer of CoFe(10%) formed to a thickness between approximately 5 and 15 angstroms on which is formed a layer of NiFe(18%) of a thickness between approximately 25 and 35 angstroms.

29. The device of claim 21 wherein the upper capping layer is a layer of Ta formed to a thickness of between approximately 200 and 300 angstroms.

30. A method of forming a tunneling magnetoresistive (TMR) read head with an ultra-thin tunneling barrier layer of high smoothness and breakdown voltage comprising:

providing a substrate, which is an NiFe lower shield and conducting lead layer having a substantially planar upper surface;

forming a Ta overlayer on said substrate;

sputter-etching said Ta overlayer, reducing it in thickness and rendering its upper surface smooth and amorphous;

forming an NiCr seed layer on said sputter-etched Ta layer;

forming an AFM pinning layer on said seed layer;

forming a synthetic pinned layer on said pinning layer;

forming a naturally oxidized tunneling barrier layer on said pinned layer, said tunneling barrier layer being smooth and homogeneous as a result of being formed on said Ta sputter-etched overlayer and said NiCr seed layer;

forming a free layer on said tunneling barrier layer;

forming an upper capping layer on said free layer; and

forming an NiFe upper shield and conducting lead layer on said capping layer.

31. The method of claim 30 wherein all layer formations are by sputtering in an ultra-high vacuum sputtering chamber.

32. The method of claim 30 wherein said NiCr seed layer is formed of NiCr having 35%-45% Cr by number of atoms.

33. The method of claim 30 wherein the overlayer of Ta is formed to a thickness between approximately 60 and 80 angstroms and is sputter-etched to remove between approximately 20 and 30 angstroms and to render the sputter-etched surface smooth and amorphous.

34. The method of claim 30 wherein the antiferromagnetic pinning layer is a layer of MnPt formed to a thickness of between approximately 100 and 200 angstroms.

35. The method of claim 30 wherein the formation of the synthetic pinned layer comprises:

forming a first ferromagnetic layer of CoFe(10%) formed to a thickness between approximately 20 and 25 angstroms;

forming a coupling layer of Ru on said first ferromagnetic layer, to a thickness between approximately 7 and 8 angstroms

forming a second ferromagnetic layer of CoFe(50%) on said Ru layer, to a thickness between approximately 25 and 30 angstroms.

36. The method of claim 30 wherein the process of forming a naturally oxidized tunneling barrier layer comprises:

forming a layer of Al or a bilayer of HfAl on said pinned layer;

placing said formation into an oxidation chamber;

purging said chamber with oxygen gas at approximately 75 millitorr pressure;

leaving the fabrication in the chamber for approximately 15 minutes.

37. The method of claim 36 wherein said Al layer is formed to a thickness of approximately 5.75 angstroms, as a double atomic layer in the (111) crystal plane and, when oxidized, forms a layer having the wide band-gap of an insulating material.

38. The method of claim 36 wherein the Hf layer of said HfAl bilayer is formed to a thickness of between approximately 1 and 2 angstroms and the Al layer is formed to a thickness of between approximately 4 and 5 angstroms.